SCI-FUN

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FUNSCHOOL

These are wonderful 'Science-Fun Stories' for school-going children.

They encompass an innovative concept in which, science experiments have been interwoven in short stories.

These virtually 'Zero Cost' experiments can be performed by the children at home or at school and on their own.

- RAJIV TAMBE

- rajcopper@gmail.com

- www.rajivtambe.com

01. A Boiling Experiment

We had a craft class yesterday.

The children had brought colourful card sheets. Some said that they were going to make a paper tray while others said that they were going to make a small paper vessel.

Just then Simran asked me, "What shall I make for you with this paper?" The other students also wanted to make something for me.

"All of you together make a paper vessel which is slightly bigger than a matchbox. But remember you must not use gum. You must fold the paper tightly and use paper clips instead of gum.

"Sure", they said.

Yet Rohan raised his hand and asked, "What will happen if we use gum?" There was silence in the class.

"Then …maybe the paper will catch fire…!" The children did not allow me to complete my sentence. Their voices full of fear/ wonder/ amazement / curiosity.. ..

they said, "Whaaaat? Fire…? ooiieee!"

"Yes, all of us are going to do some magic together. Let's heat some water. That is why we need a small paper vessel." Now the children's curiosity was kindled.

By afternoon this news had spread all over the school.

“What? Boil water in a paper vessel? Ha! They must be burning paper to boil water. You might have heard it wrong.”

This was the hot topic everywhere. By evening more than half the students had made paper vessels.

The principal said, “We will perform this magic for all the children.”

By the next day the children’s’ curiosity knew no bounds. They gathered in the school’s hall.

I said to them, “I will not do any experiment. I will not heat water in a paper vessel either. Sorry!”

The children were very disappointed. Some let out a sigh.

Others raised their eyebrows. The children in my class were completely dejected. But Palavi raised her hand and asked, “Then who will do this experiment?”

I answered with a very straight face, “You children!”

The children screamed with joy, “Yahoo!”

We made groups of four each. Each one had a square vessel of thick paper that they had prepared yesterday. Each group was given a matchbox. Since the experiment was to be done together, a specific method was decided upon.

- First, the experiment had to be observed carefully.
- After the experiment was over, everyone should carefully write down their observations in a notebook.
- The observations should be read out and each one should write down the points that they felt were important.
- Questions should be asked about the observed experiment.
- Questions which are complementary and parallel to the experiment should be asked.

We lit a candle and placed it on the table. We filled water in the paper vessel. We held the vessel over the flame.

We took care to ensure that the flame reached only the base.

And in just a short while the water actually started boiling.

The children went berserk with joy.

At that moment I could read the question in the eyes of the children, "How did the water boil without the paper burning?" The answer is really very simple.

The paper does not burn because all the heat that the paper gets is used up for heating the water.

We all know that water boils at a temperature of 100^0.

But for paper to burn/catch fire much more heat is required. And that is why the water inside a paper vessel boils without the paper getting burnt.

The children asked fantastic questions:

- Is it possible to make tea in this manner?
- Can we boil milk?
- If we take a bigger paper vessel, would it be possible to fry potato chips in it?

While doing the experiment in groups the children were bubbling over with joy long before the water started boiling!

The children labelled this experiment as the 'boiling experiment'.

I think you will be able to answer all the questions raised by the children but only if you do this 'boiling experiment' yourself!

And if you do it with other children…!”

I’m waiting for your boiling letters.

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02. NAUGHTY BALLOONS

Today the class was very quiet. I found it very unusual.

Suddenly Anvay puffed up his cheeks and pointed towards Rohan. Simran did the same thing while Shilpa puffed up her cheeks and pointed at Priya.

I called Priya and Rohan. I puffed my cheeks and gestured to ask what it meant.

Priya and Rohan removed some balloons from their pockets and kept them on the table….and the entire class burst out laughing sounding just like the balloons being burst!

There were five balloons of various colours.

I asked the class, “What shall we do with these balloons?”

“We will blow them… burst them… fly them… fill them with water… and perform some magic… let’s have some exciting experiment.”

“Excellent! Cool! We will have some fun with the balloons…we will make them push…dance…sway…or keep them still...Okay?”

“Yes, yes”, shouted the kids. “But how shall we do it?”

We quickly blew air into the balloons and filled them up.

We tied two balloons with threads and hung them on the blackboard.

“Now let these balloons play”, I said.

“How will they do it? How will this happen?” asked Anvay.

I called him near the blackboard and rubbed the hanging balloons on his head. And those two balloons began fighting with each other. They started pushing each other.

If one balloon went close to the other, the other would move further away. The class was watching this with bated breath and were wonderstruck.

Let us watch some more fun.

An ordinary balloon filled with air was kept between these two fighting balloons.

What a surprise…these two balloons held this ordinary balloon between them very tightly.

After seeing this the class made so much of a racket that it startled even the hanging balloons! The balloon between them slipped and fell down.

This balloon was then tied at the other corner of the blackboard.

“Anvay is always full of naughty ideas so the balloons were naughty”, I said.

Immediately Priya insisted that another balloon should be rubbed against her head. Let's see what happens.

A new balloon was rubbed against Priya's head.

It was taken near the balloon which hung at one end…but there was nothing!

The children started thinking. Why did this happen?

Priya took the balloon and observed it.

I decided to give the children a clue.

I asked them if they could observe any difference in the places on the head where the balloon was rubbed.

They remarked that Priya's hair was more shiny than Anvay's. Priya explained that she had oiled her hair.

"Hmm, there was no magic because of the oil!" shouted the children and just then Simran ran towards the blackboard.

She snatched the balloon from Priya and rubbed it vigorously against her sweater. Just as she was about to take it near the other balloon, Priya pulled her back. Simran held the wall for support and the balloon slipped from her hands…

then what a miracle…the balloon stuck to the wall.

All the scientists in the class shouted and clapped as this was a discovery for them.

"We will also now push against each other with balloons and stick them to the walls of our houses."

All this while Rohan was watching restlessly.

He got up quickly and picked up the fifth balloon from the table. He rubbed it against his head. He set out towards the balloon hung at the other corner of the blackboard. He

reached the blackboard. Just as Rohan was about to touch the hanging balloon with the balloon in his hand, Priya and Simran ran towards Rohan. Rohan extended his hand in the direction of the balloon which was hanging. At that very moment Priya and Simran pulled him back and…

there was yet another miracle!

The balloon which had been lolling on the blackboard all this while was suddenly wide awake so to say!

That balloon suddenly leaped towards the balloon in Rohan's hand.

The distance between this balloon and the balloon in Rohan's hand was about 2 cm.

Rohan was startled by this sudden attack, he raised his hand and moved it here and there…and…the hanging string suddenly straightened up! The hanging balloon started dancing before Rohan's balloon with 'a stiff string and its nose in the air'.

The children were so taken aback by this scene that they even forgot to clap.

Now I thought the time had come to explain this mystery.

When a rubber balloon is rubbed against a cotton, nylon or woollen surface, the electrons on these surfaces come onto the balloon's surface and the balloon becomes negatively charged. When two such negatively charged balloons are brought near each other they repel each other. This is known as 'repulsion'.

However, if a balloon that is not charged is brought near such a charged balloon, it gets attracted to that balloon. This

is because two opposite charges attract each other and this is known as ‘attraction’.

If we take a charged balloon near a wall it sticks to the wall because opposite charges attract. After a while the electrons disperse into the air and the balloon falls off the wall.

Now what do you think, who must have danced, the children in our school or the balloons?

And in your house are you the only one who dances or do some hanging balloons join you?

Will you let me know?

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03. Delusive Colors

Today the classroom was very colorful. Colored paper, colored pencils, crayons and sketch pens of weird colors. Even the children were dressed in colorful clothes.

Surprised, I asked “Is it everyone’s birthday today?”

Immediately they answered, “Today is colors’ day! So everything is going to be colorful today.”

Simran said, “Today we will only play with colorful toys.”

“Yes, yes,” yelled the children, “we want color.. color everywhere!”

"Can you recognize colors? Can you gaze at a color intently? Do you remember the colors in a picture"… Not letting me continue, the kids screamed "yes, yes, yes!"

"Ok, then let's play a game of changing colors.

Take two sheets of white paper. Keep one aside for the time being.

On the other, draw a square measuring 3 x 3 inches as shown on the blackboard. Draw a border of at least half an inch for the square." Now the class got down to work.

Anvay protested, "But…what about those colors?"

Quietening him I said, "Color the square dark green and put a black dot in the centre."

The children used colored crayons, pencils, water colors and sketch pens.

Anvay continued to grumble and said, "At least let's color the border with a different color…something like bright yellow."

Everyone nodded in agreement and the borders started getting colored in all kinds of bright yellow color.

"Now hold the picture in your right hand and the sheet of white paper in your left hand.

Gaze intently at the paper in your right hand for a minute. Concentrate on the color in the square and the black dot in the centre. Then in bright light quickly move your gaze to the paper in your left hand but without moving your eyelids…and see the magic!

You will see different colors on that white paper."

They were all very excited.

The classroom was silent for hardly a minute and then all at once the children triumphantly cried out, "Yes…yes, we saw strange colors, changing colors, deceptive colors…"

A string of questions started, "How did this happen? What will happen if we take different colors? Can yellow and blue be taken together? What would have happened if we had drawn a circle instead of a square? Suppose we had colored the square with two colors instead of one...?"

"First let's understand the magic behind these colors. I am sure that will answer most of your questions. And after that if some questions still remain then…"

Before I could continue the children shouted, "Then you will have to experiment and find out! Now tell us about the magic."

Actually our eyes can see only red, blue and green colors. The brain combines the different sensations from these colors to decipher many more colors. The retina of the eye contains rod-shaped (rods) and conical (cones) cells. There is a slight difference in their functions.

The cones take in the finer details of things while the rods though not good at recording finer details function better than the cones at night.

Cones comprehend colors. If they are used continuously over a period of time, they become tired and after some time they find it difficult to identify the colors. It is because of this that we observe a change in the colors of a picture.

In our game, if we gaze continuously at the dot then the cones recognizing the green and yellow colors are tired out.

So suddenly if you turn your gaze to the white paper seven colors are seen together as the white color is made up of those.

Since the cones are tired, they cannot identify the yellow and green.

When green is removed from white, what we see is red and similarly when yellow is removed from white, we see blue.

As a result we see a red square with a blue border on the white paper which is in reality a delusion.

Anvay, Simran, Shilpa, Priya, Rohan and Palavi raised their hands and said, "But we are going to experiment with different colors. Our cones might get tired but we will not."

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04. Pin

By

Pin

Today all the children had crowded around Simran in the class. I bent over their heads and saw that Simran had brought a sparkling glass to school. Since it was summer she had got some juice to school. How can you drink juice without a glass? All the children wanted to see the glass at the same time. The

glass was kept on the table. Just then Radhika poured some water into the glass and filled it to the brim. Then Chinmay came with some water. But no! He couldn't pour any water in it. Chinmay was disappointed.

I made Chinmay stand near the table and asked everyone, "What if Chinmay wants to put a few things in the glass? But on one condition…the water should not spill out. Is it possible?"

Palavi raised her hand and said, "Yes, I can do it. I will release air into the glass without spilling any water." Everyone clapped.

"I meant 'things' not air", I clarified.

Now Chinmay was getting restless.

I whispered something in his ear.

Chinmay ran to the office and got a box of pins. Since the glass was filled to the brim, nothing could be put in. The children were sure that if anything was put in, the water would surely spill over.

The box of pins was opened. Now all the children were watching with bated breath.

I took a pin, held it near the edge of the glass, and released it gently into the water. The pin had to be put in gently and not thrown in.

"Ss…ssss", the children shouted with joy.

Now each child wanted to put in a pin. Since the glass was very full, the children came up to the table cautiously, so as not to spill the water and then gently released the pin into the glass.

The children were very careful, as if they were counting a tiger's teeth.

Eighteen pins were put in.

But when the nineteenth pin was put in, the water spilled over.

The children were very disappointed.

They said, "We too wanted to take part in this experiment, we wanted to put in pins, pin by pin."

I calmed them down and said, "But have I said that the experiment is over? This is just the beginning.

Suppose I put in some drops of liquid soap in the glass and then fill it with water, do you think more pins will fit in or less…?"

Before I could finish, Simran said, "Or the same number of pins?"

"Let's find out," the children shouted.

Chinmay ran to get a bottle of liquid soap kept near the washbasin.

Now the glass was emptied. All the pins were removed.

A few drops of liquid soap were put in and the glass was filled to the brim.

The children became cautious again.

They started putting in the pins gently.

Though eighteen pins were put in, the water didn't spill over.

Simran picked up the nineteenth pin.

The class was suddenly silent. They held their breath and waited to see what would happen.

Simran not only put in the nineteenth pin but also released one more pin after that into the water. The water didn't spill over.

The children shouted "Ss…sss"

What do you think? How many more pins must have been accommodated in the water? And suppose instead of liquid soap, we had put in milk or kerosene in the glass of water, do you think the number of pins accommodated would have been more or less as compared to plain water?

When we put in pins in a glass containing plain water, the pins are accommodated because of the surface tension of the water. In such a situation, the surface gets stretched but the water does not spill over. But as the number of pins increases, the surface of the water starts curving. And after a specific number the water spills over.

But if any soluble substance is mixed in water its surface tension changes and it can accommodate more pins.

You can try this experiment with different mixtures. Make a note of your observations.

You can enjoy yourself 'pin by pin'.

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05. Let us go

for a

Water Ride

As I entered I noticed that there was ruckus in the class.

After I made the children calm down, I came to know that there was a matchbox in Simran's school bag. Simran was scared that she would be scolded and punished for getting a matchbox to school. The other children were also unnecessarily scared.

Simran said in a small voice, "I didn't get it on purpose. Yesterday evening I was playing a game of matchstick puzzles with my dad, and by mistake I put the matchbox in my school bag after I finished."

"Oh, it's a good thing that you happened to bring this matchbox along. Today, let's play a fun game with matchsticks." The children were immediately very enthusiastic.

We had a plastic tub in the school. The children filled half of it with water. There was a bottle of liquid soap which we used for washing hands. I removed a pen-knife from my pocket. All these things were arranged on the table.

"Now let us make boats out of these matchsticks and set them afloat. The boats must move by themselves. You should not touch the tub or the water in it. Tell me, how will you do it?"

The children were full of ideas:

“Let’s put the sticks in soapy water.”

“We will cut the sticks, then soak them in soap and then put them in water.”

“We will stir the water with the knife.”

“First soak the knife in soap, put it at the bottom of the tub, and then put some soap on the sticks.”

The class came up with amazing ideas.

The kids should be allowed to toy with various options; only then their minds are enthused with creativity.

As shown in the figure, I gave a small cut at the rear end of the stick. A drop of liquid soap was applied on the cut. Now the stick was placed gently in the water in the tub. The moment the matchstick touched the water in the tub, it started moving. It went ahead in a straight line.

The children clapped with joy!

Now the children were eager to set their boats in water. We counted the matchsticks. There were 25 matchsticks but the children were 30! What could be done? Nothing could be brought from outside. At the same time, everyone should get a chance to perform the experiment. “Let’s see what can be done.” The children started thinking furiously.

“Let’s break the sticks.”

“We can cut a small piece of an eraser since rubber also floats on water.”

“We can cut and use the matchbox since all the matchsticks are going to be needed anyway.”

Everyone approved of the last idea.

The cardboard matchbox was cut into boat-shaped pieces. We decided to have a race between the 25 matchstick boats and the 5 cardboard boats.

Just then Mihir said, "What will happen if the cut is a slant instead of a straight one or one of the sides of the cut is turned towards the left or the right?"

The simple answer to this question was to do it and see for oneself.

We cancelled the race.

Each child gave a cut as he liked.

Soon the boats were in water. The ones with the straight cut moved ahead in a straight line while the ones with a cut to the left or right moved in circles.

Simran said, "But what if we use paper instead of matchsticks…and make a hole instead of a cut?"

The children shouted, "Let's find out!"

The paper was made into a flat roll as shown in the figure. A small hole was made in the middle of the roll. A big drop of liquid soap was put on this small hole. The roll was slowly placed in the water.

And then…the roll started moving in fast circular motions. The children shouted with joy, "Let's ride on water."

When a matchstick with a drop of liquid soap is put in water, the soap starts dissolving in water as soon as the spot with the drop of liquid soap touches the water. As the soap starts dissolving, the surface pressure starts decreasing. But the front portion of the stick now has greater pressure. Due to this unequal force the stick moves ahead automatically.

"Now tell me, why do you think the roll of paper moved in circles?" I asked the children.

The answer is very simple!

What do you think the answer could be?

I am waiting for your answers, but straight ones, not ones going about in circles!

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06. Helicopter

The Sheriff was to come for a public meet in our neighbouring village. He was to come by a helicopter. We decided to visit the village so that the children would be able to observe the helicopter from close quarters.

The next day, only one topic dominated in class – 'helicopter and helicopter'. It keeps still and then quickly moves forward and backwards. The important thing is it can turn easily even in very little space.

The children said, "We too want a helicopter."

"How many of you want a helicopter?"

As soon as I asked this all the children raised their hands. They were about to make a racket.

Just then, I asked them, "Now look here, I know all of you want helicopters but tell me, how many do you want? one? two?... or three?"

"We want three, three helicopters now…at this very instant" clamoured the children.

"And that too free!"

"First we will perform some magic.

Then.. only

I will give each child three helicopters absolutely free!" The children looked at me suspiciously as I said this.

I removed an apple, a pen-knife, a candle, and a matchbox.

The children were unable to comprehend the connection between a helicopter and an apple.

The apple was cut vertically right through the middle.

A candle was lit.

Now this (cut) apple has to be held in front of the mouth and the candle should be blown out with a strong puff. Who will do this?

Simran came running. She tried to blow out the candle with all her might but without any success!

She shook her head and said, "How can the candle be blown out? Nothing can pass through this apple."

Ganesh, Rohan, Priya, everyone tried.

But no!

When the children asked for the apple, I would deliberately give it in such a way that the flat surface would face their mouth.

But Mihir took the apple and moved it in his hands.

Then he held the semi-circular part of the cut apple in front of his mouth and gave a loud puff…what a miracle!...

The candle was blown out.

The children clapped with joy.

But Priya was lost in thought as usual. She raised her hand and asked, "But how did this happen?"

The children stopped clapping and started thinking.

"This principle is used when a helicopter is designed."

"Which principle?" shouted the children.

"This meaning, the candle was not blown out when the flat surface of the apple was held in front of the mouth. But the candle was blown out when the semi-circular part was held before the mouth.

"Now, tell me, how did this happen?"

The children's brains were working furiously.

They gave different answers, "if the flat surface is held in front of the mouth, then the air collides against the flat surface, moves away and the candle is not blown out. But air moves with speed on a semi-circular surface. When the speed increases, pressure also decreases automatically. So the air surrounding the semi-circular apple brings together the air coming from the sides of the rounded surface of the apple and the candle is blown out.

Simran said, “I have understood now. We have to consider the pressure of air, and also its direction…isn’t it?” Everyone nodded in agreement.

I removed 50 strips of thick paper from my bag. I had brought along strips which were 6 cm broad and 28 cm long. I drew a figure on the blackboard. The children were supposed to cut on the dotted lines, and fold on the straight plain ones. The children got down to work.

The helicopter’s fan with its two blades and a tail was ready after the second fold and the top part was bent.

The tip of the tail was folded and a ‘u-pin’ was stuck there. So the weight towards the bottom increased.

Each child wrote his name on the helicopter.

All the pilots in the class went to the terrace to fly their helicopters. In a minute, 40 helicopters flew from the terrace and landed with a whirl.

The children were hardly satisfied with one flight. So the next 20 minutes were officially allotted for ‘flights’!!

Then two different helicopters were made. Their wings were of different shapes.

What happens if the shape of the wing is changed?

What happens if the ‘U-pin’ is not attached or a plain pin is used instead of the ‘u-pin’?

Does it make a difference if you take thin paper instead of a thick one?

The children experimented with these ideas.

Rohan took a thick paper while Mihir took a thin one for their helicopters. Both helicopters were flown at the same time and observations were recorded.

For example, which helicopter floats for a longer time?

How far does it go?

Which helicopter whirls faster?

Does it move or remain stable as it whirls?

This was one example.

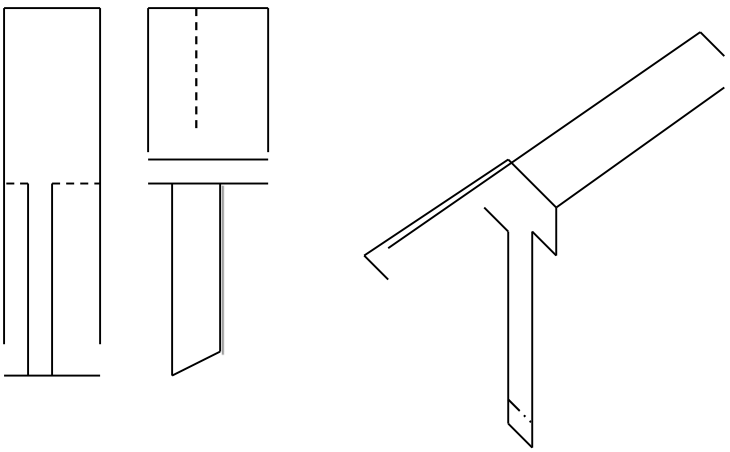
The children experimented in pairs as well as independently and jotted their observations.

The planes take a longer time to come down in the afternoon while in the evenings they come down quite quickly. This observation was made by one of the young pilots in the class.

You can also become a pilot if you have a piece of paper!

And if you put in a little effort, you can have a fleet of planes.

I am waiting for your flying letters!



07.

Fold

Upon

Fold

As I entered the class, the children shouted, “Tell us some more interesting things about paper.”

They had probably already decided something as they had all come armed with newspapers from home.

I took one of the papers, and said to the children, “Now this paper can be cut, torn, and …”

The children continued, “It can be folded, crumpled, burnt, pierced or it can be moistened into a lump, or it can be made into a kite or a ball…”

In short, so many things can be done with paper.

“Today, let’s play a game of folding the paper. Who can fold the paper many times over?” I asked.

"We can, we can!" shouted the class in unison.

"How many times can you fold a piece of paper?"

Everyone had different answers to this question…

Simran answered 10, Ganesh said 15, while Mihir's answer was 18. But Shilpa felt that the number of folds depended on the size of the paper, the bigger the paper the more one could fold it.

Soon there was chaos in the class as each one had a different answer. So the best thing was to start the experiment immediately.

Each child had to take a paper. The paper could be big or small, thick or thin. It could be paper from a notebook or a newspaper.

Remember, to fold a paper you must join it from edge to edge.

I think you won't be able to fold the paper more than nine times; do you want to bet?"

The children shouted excitedly, "Yes, yes, the bet is on. Don't underestimate us. We have an idea. We will take the biggest paper possible and fold it 27 times. We will win this bet! Come on…let's take the biggest paper and win this silly bet."

Simran took a double sheet from a newspaper. Mihir and Shilpa joined two double sheets to make one big paper.

Ganesh got a foolscap paper from the office. He measured it with a scale and calculated something. He joined the edges of the paper and again calculated something. Ganesh looked worried.

Charuta cut strips of paper. She joined them and made one long strip of paper. It was so long that it could be held from one end of the classroom to the other. Charuta was bubbling with joy.

It was decided that each child would write in a notebook his estimate about how many folds he would be able to make before starting the experiment.

The children were very eager. Their enthusiasm knew no bounds. Each one felt that they could easily fold the paper 15 to 20 times. They couldn't wait to start.

By now the children realised that this was not just a game but a scientific experiment, and they began in earnest.

Simran, Mihir, Ganesh, Shilpa, Charuta folded their paper once.

Then they completed the second and third fold.

The fourth fold was quite troublesome.

Two, three children did the fourth fold together for every piece of paper. The children were now whispering among themselves.

If the fourth fold was this difficult, then how could they manage 20 more folds? Charuta was thinking hard.

Ganesh was again calculating something.

I knew Ganesh was up to something.

But I had decided that I would not ask him anything till he told me about it.

Now the whole class pounced on the same piece for the fifth fold.

Only Ganesh was struggling with his paper and calculations. The children could not fold the paper for the fifth time as well as they would have liked to even though they had

put in a joint effort. It was quite obvious from their faces that they thought the sixth fold to be impossible.

Still, Mihir, Simran and Shilpa tried very hard…but no!

Nobody could manage the sixth fold.

All the stalwarts in the class were not only tired but also quite surprised… "How did this happen? Why couldn't we…?"

I told the class that Ganesh would explain why they were unable to make the sixth fold.

This startled Ganesh but he calculated something. With great confidence, he announced that it was impossible to fold the paper even eight times, forget nine!

Immediately, the class shouted, "why?"

And Ganesh explained, "When a paper is folded its layers increase by geometric progression;

For the first fold, there will be two layers,

For the second fold four (2 X 2 = 4)

For the third fold eight (4 X 2 = 8)

For the fourth sixteen (8 X2 =16)

and

For the fifth fold, 32 (16 X 2 = 32) layers come together.

It was possible to join their edges.

In this manner, the sixth fold will have 64 layers and the seventh fold, 128.

It is impossible to fold so many layers by hand at one time. We will need a machine for that, isn't it?

The children had got confused because they didn't know that no matter whether the paper was big or small, the layers would have increased geometric progression.

The children clapped.

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08. Just two pieces…

Here And There

I was shocked as I entered the classroom yesterday. For a moment, I wondered if I was in a classroom or a printing press!

There was more paper in the class than children. Innumerable bits of paper beside every child. The children had just finished their craft class and were experimenting with the leftover paper. The papers were of varying kinds and colours.

Watching the children immersed in this kind of '*paperwork*', I decided to take up other topics which could be associated with paper. I asked all the 'Junior scientists' in the class to gather their material carefully.

I asked the children, "Would you like to fold the paper or tear it?"

"We want to tear the paper", the children shouted with glee.

"Come on then, let us experiment with tearing paper.

Let's see who can tear a paper as instructed. Tearing a paper is not an easy task at all!"

The children waited eagerly as they were getting to do something that they loved to do. Each child took a piece of paper.

Every child had a different piece of paper— some had kite paper, some newspaper, some had a bit of notebook paper and some had thick blotting paper.

Now this paper has to be cut vertically up to $3/4^{th}$ the height of the paper as shown in the figure or you can tear it with your hand if you wish.

After she tore the paper gently, Simran said, "You said that it was a tough thing to do but we managed it quite easily." The class made a ruckus as Simran spoke.

I told the class to be quiet and told them that the real experiment would begin only now.

Now hold the piece of paper horizontally in both the hands and pull it slowly or quickly towards the top in both the directions. It has to be done in such a way that there are three pieces of paper and the piece in the middle should fall down.

Is it easy?

"Easy, very easy!" they shouted and quickly tore the paper by pulling it in both directions. But the paper could not be torn into three pieces. The children quickly took some more pieces of paper. They tried different types of paper, some cut the paper vertically at different lengths and tried again.

Simran tried it with a big newspaper piece instead of a small one. Rohan tried to gently tear a piece of thin kite paper. Charuta took very thick paper. The children tried different ways but the result was the same!

Though the piece of paper was torn at two places, nobody could tear it into three pieces with both hands! They were left rubbing their hands and crumpling paper!!

Now the children became cautious. Their enthusiasm increased and their curiosity was kindled. They were now convinced that there must be a scientific reason behind this seemingly simple act.

How did this thing which seemed so easy become so difficult? Why couldn't we tear a piece of paper into three pieces? We must find out. All the pieces of torn paper were collected. They were observed carefully.

We tried to figure out what exactly we do when we tear paper. What do I do? What do others do? We tried to find out what happens with various types of paper. We also tried to see if the pressure exerted by both hands while tearing is the same. We also keenly observed when and at what point did the paper actually begin tearing.

We found out some basic conditions which are a must for a piece of paper to be torn into three pieces :

- The place where the paper has been cut or torn should be such that both the sides should be equal.
- The piece of paper has to be uniformly thick for the paper to be torn into three pieces.
- The pressure exerted by both hands has to be equal and at the same speed.
- It is necessary for all these things to happen at the same time.

But all these things do not happen at the same time and so the paper does not tear into three pieces.

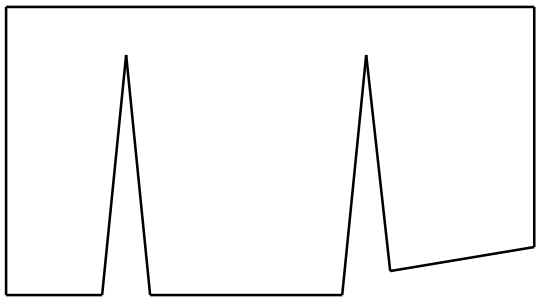
Then why does the paper tear into two pieces?

Our observations regarding ‘how does paper actually tear’ helped us to answer this question.

Like any other material paper first tears at the weakest spot. In our case, the place where the paper was cut was its weakest point. As we pull the paper, it first tears at the cut which is the weaker of the two. As a result it becomes weaker and tears faster and ends up in just two parts. And whatever the type of paper, the result will always be the same.

The children were really pleased!

“This is a wonderful idea! We will ask Mom and Dad to do this when we go home and surprise them!”



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- **RAJIV TAMBE**
- rajcopper@gmail.com
- www.rajivtambe.com